REMARKS

ON AMENDMENTS TO THE CLAIMS

The claims of this application have been reviewed in light of the first Office Action, mailed from the PTO on April 7, 2005. Claims 1-68 are pending; no claim has been allowed. Claims 1-7, 10-43, 47, 48, 50-53, 56 and 58-68 are rejected. Claims 8, 9, 44-46, 49, 54, 55 and 57 are objected to as being dependent upon a rejected base claim. In response, and pending consideration of the following remarks, claims 1, 2, 3, 5, 17, 26 and 47 have been modified to better claim the invention. In addition, claims 69-73 are added as new claims. An additional fee for these 5 new dependent claims is required and is attached (69-73 are based on a revised claim 17).

References: Lang, US Patent 6,651,035, hereinafter termed Lang '035.
Lang, US Patent 6,522,994, hereinafter termed Lang '994.
Nevruz, US Patent 5,847,266, hereinafter termed Nevruz.
"Performance Test Procedure Sodium Based Recovery Units", CA Report No. 84041601, March 1996, TAPPI Press, Atlanta Georgia; hereinafter termed the TAPPI Code.
American Society of Mechanical Engineers' (ASME) Performance Test Codes 4.1 and 4; hereinafter termed PTC 4.1 & 4.
"Acceptance Testing of Steam Generators, DIN 1942, DIN DEUTSCHES Institut Fur Normung E.V., February 1994; hereinafter termed DIN1942.
"Water-Tube Boilers and Auxiliary Installations - Part 15: Acceptance Tests", November 1999, European Committee for Standardization prEN 12952-15:1999, Central Secretariat, rue de Stassart, 36, Brussels; hereinafter termed EUstd.
"Code for Acceptance Tests on Stationary Steam Generators of the Power Station Type", British Standard BS 2885:1974, ISBN: 0 580 08136 2; hereinafter termed BS2885.

Claims 1-7 and 10-43 (excluding Claim 17):

Office Action indicated that a double patenting issue might exist as associated with claims 1-7 & 10-43 of the present application and claims 1-7 & 10-43 of Lang '035 in view of Nevruz. Note that the present application's claim 17 has been revised, discussed separately.

It is true that the basic philosophy of detecting tube leakages as explained in Lang '035 would apply to any combustion process - given that process is to be understood using combustion effluents to determine the nature of the fuel supplied. However, a "basic philosophy" is not a description sufficient for proper teaching the art, i.e., allowing another skilled in the art to reproduce at patent term. For the invention described in the present application to function, detailed teaching of sodium chemistry associated with recovery boilers is required. Unlike the conventional processes described in Lang '035 (and Lang '994), carbon and hydrogen stoichiometric balances are directly and materially affected by sodium-based chemistry (see §0051). Lang '035 teaches only hydrocarbon stoichiometrics, not hydrocarbon/sodium stoichiometrics and associated black liquor compounds.

The reliance on Nevruz is, respectfully, not applicable for the following reasons:

- Nowhere in Nevrus is mentioned any stoichiometric relationship, no mention is made of the interaction between carbon, hydrogen, etc. and black liquor related compounds.
- The Nevrus invention detects tube failures in recovery boilers using a mass balance about the working fluid (a water balance) - having nothing to do with the combustion process. In this Applicant's reading of Nevrus, the word "combustion" was not found. Nevrus determines "fluid leakage loss [i.e., tube leaks] based on the difference between the measured fluid input and output values"; see Nevrus Col.2, Lines 17-19 and 32-33. Nevrus teaches the details of his monitoring when discussing the system's feedwater flow, drum blow-down, attemperation (spray) flow, steam output flow and drum fluid level, thus forming a water balance; see Nevrus Col.3, Lines 16-37. It is to be noted that the present application mentions such a technique in its BACKGROUND discussion (as well as the use of artificial neural network technologies), finding such techniques wanting, see §0010.

It is the interaction and understanding of combustion products from black liquor, including Na_2CO_3, K_2CO_3, Na_2SO_4, Na_2S, NaCl and SO_2 (the carbonates of Na and K predominate) - with the end purpose of deducing fuel chemistry from effluents - that is the teaching of the present

application. Neither Lang '035, nor Lang '994, nor Nevrus speak to this basic concept. Yes, Lang '035 teaches the use of Choice Operating Parameters (eight COPs, Λ_i, are taught, e.g., the effluents CO_2, O_2 & H_2O). However, the present application requires specialized COPs needed to integrate, and then resolve, black liquor stoichiometrics. These new COPs include:

- the Sodium to Carbon Ratio in the fuel (Λ_9, also termed φ_N); and
- the Reduction Efficiency (Λ_{10}, also termed φ_R).

To quote from the present application's §0048: "The Sodium to Carbon ratio in the fuel is a key parameter, determined periodically by laboratory analysis, as it allows stoichiometric inter-dependency between the organic and inorganic fuel components." See also the application's §0032 and §0043, and Eqs.(221S) through (220).

Without these additional COPs, and the teachings of how to correct their inputs through minimization techniques, the utility of the invention would then be dependent on continuous on-line measurements of these values having absolute accuracy. Such measurements being made with or without the presence of a tube leak. Refer to §0081 through §0108 for discussion of minimization techniques, COPs, etc.. Measurement of any power plant variable with absolute accuracy counters all practical experience. Periodic measurements (Λ_{10}) or assumptions (Λ_9), having great and direct sensitivity on fuel chemistry require on-line corrections. This is especially true of the Sodium to Carbon Ratio and the Reduction Efficiency:

- the Sodium to Carbon Ratio in the fuel
  - is an assumed value based on periodic measurements, a value which is continuously corrected as taught by the present application, and
  - is not mentioned in the TAPPI Code; and
- the Reduction Efficiency
  - is an assumed value based on periodic measurement, a value which is continuously corrected as taught by the present application, and
  - is traditionally measured only periodically in the laboratory (see the TAPPI Code, §6.1.10 and §6.1.10.4).

Without these COPs (i.e., correctable inputs), this invention would then require on-line elemental analyses of the black liquor fuel (to be done with complete accuracy) to determine the Sodium to

Carbon Ratio, and an on-line analysis of the smelt to determine the Reduction Efficiency. There is no known applied technology which measures either variable in real time (on-line).

In conclusion, the present application's Eqs.(30) through (41), (44) and (47A) through (47H) contain an intermix of carbon terms (α_{MAF-4}), hydrogen terms (α_{MAF-5}), oxygen terms (α_{MAF-3}) and sodium terms (α_{MAF-14}). Indeed, the derivation of Eqs.(47A) through (47H), the ξ_{Ci} terms required for system stoichiometric solutions of fuel carbon, Eq.(44), fuel moles, x of Eq.(45), and the critically important fuel water, Eq.(58B), is considered unique and non-trivial. One of ordinary skill would not be able to develop such methodology or, given the importance of detecting tube failures in recovery boilers - which are life threatening - such effort would of occurred since the publication of Lang '035 in November 2003. No such effort exists.

Claim 17:

Claim 17 has been revised to claim how an air pre-heater leakage factor (R_{Act}) allows gaseous measurements to be employed on either side of the system air leakage. This concept is significant to the determination of fuel chemistry based on combustion effluents, as it allows gaseous concentrations to be converted from either side of system air leakage - to then be used with consistency with like measurements. Thus, for example, if computations are to be made on the upstream (Boiler) side but some of the needed measurements are made on the downstream (Stack) side, conversion to the upstream side may be facilitated. If Input/Loss computations are made based on Boiler O_2, but CO_2 and SO_2 measurements are made at the Stack, the Stack measurements can be reduced to a Boiler reference by multiplying the Stack concentrations by R_{Act}. Refer to §0046 for examples, and to §0047 for a detailed discussion and derivation of R_{Act}. Further, use of R_{Act} is made throughout the present application, and is involved (with the concentration of oxygen in combustion air, A_{Act} leading to ϕ_{Act}) in determining the Air Pre-Heater Dilution Factor (β, see §0027 & §0046), which appears in the governing combustion equation, Eq.(19BL).

Claims 47, 48, 50-53, 56 and 58-68:

Office Action indicated that a double patenting issue might exist as associated with claims 47, 48, 50-53, 56 & 58-68 of the present application and claims 1, 2, 13, 15-17, 24-27, 31, 33, 45, 46 & 72-75 of Lang '994 in view of the TAPPI Code.

The TAPPI Code details testing methods used for recovery boilers. It follows broad

philosophies established by the steam generation industry as witnessed in PTC 4.1 & 4, DIN1942, EUstd and BS2885. These standards provide guidelines for thermal performance testing (i.e., determination of boiler efficiency). Of course, the TAPPI Code considers sodium compounds, and it is useful in understanding the industry's general concerns associated with data gathering for evaluating thermal performance of recovery boilers. It this context the TAPPI Code is as useful for understanding recovery boilers as PTC 4.1 & 4, DIN1942, EUstd and BS2885 are useful for understanding conventionally fired steam generators.

The Patent Office did not find in granting Lang '994 that ASME PTC 4.1 nor any other such standard (which were referenced in Lang '994, see Col. 8, Lines 34-63), provided sufficient teachings which could of lead to development of fuel chemistry based on effluent concentrations through system stoichiometrics. ASME PTC 4 did not exist when Lang '994 was filed. No such teaching exists in the standards for conventionally fired systems, none exists in the TAPPI Code for recovery boilers. Since the time Lang '994 issued, no known effort has been made to apply its teachings to recovery boilers, until the present application.

One cannot ague that Lang '994 in combination the TAPPI Code, given one of ordinary skill, would result in the present application ... any more than assuming that Lang '994 in combination with the present application would result in the TAPPI Code; or that the TAPPI Code in combination with the present application would result in Lang '994. Lang '994 and the present application teach invention. The TAPPI Code is simply a procedure to determine boiler efficiency of recovery boilers, in the same sense, employing the same testing philosophy, as standards used to determine boiler efficiency of conventionally fired systems. There is nothing unique in the TAPPI Code, other than its black liquor fuel, relative to the conventional standards (PTC 4.1 & 4, DIN1942, EUstd and BS2885). Indeed many such standards were referenced in Lang '994 and Lang '035 - as they are in the present application - all found wanting to invention.

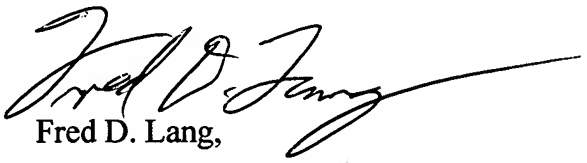
Reference is made to the remarks associated with **Claims 1-7 and 10-43 (excluding Claim 17)**.

In Conclusion

This amendment is respectfully submitted by the *pro se* Applicant, Fred D. Lang, and the Assignee, Exergetic Systems, LLC as represented by the *pro se* Applicant, Fred D. Lang, he being the President of Exergetic Systems, LLC.

Thank you for considering these amendments and remarks. The Applicant well appreciates that detailed discussions might be in order, as such please feel free to call me at any time at 415-455-0100, or e-mail at Lang@ExergeticSystems.com.

Sincerely,



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